ENVIRONMENTAL PRODUCT DECLARATION

PVC PIPES

In accordance with ISO 14025 and EN 15804:2012+A2:2019

EPD® AUSTRALASIA
ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

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RXP by aliaxis

Geographical area of application of this EPD:	New Zealand
Year taken as reference for the data:	FY18/19 - 1st July 2018 to 30th June 2019

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General Information

GENERAL INFORMATION

Programme information

An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules).

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Declaration owner	**RXP New Zealand**
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Accredited or approved by	EPD Australasia

CEN standard EN 15804 served as the core PCR

PCR:	Construction products, PCR 2019:14, 1.11 and UN CPC 369
PCR prepared by:	IVL Swedish Environmental Research Institute Moderator: Martin Erlandsson, martin.erlandsson@ivl.se
Independent external verification of the declaration and data, according to ISO 14025:2010	EPD process certification (Internal) EPD verification (External)
Procedure for follow-up of data during EPD validity involves third party verifier:	No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Company information

For over 45 years, RXP has been providing rural water expertise for New Zealand and global rural markets. RXP manufactures and distributes a wide range of uPVC and polyethylene products including pipe, injection mould fittings and rotational moulded tanks, troughs and irrigation products.

With local manufacturing sites employing over 140 local people, the vast majority of the products we sell are proudly New Zealand made.

Belonging to the Aliaxis group has also provided RXP with access to thousands of new products around the world.

Bureau Veritas is the body that certifies the compliance of RXP NZ to the following management systems:

- ISO 9001 – Quality Management Systems
- ISO 14001- Environmental Management Systems

To demonstrate compliance to New Zealand product standards, RXP manufactures PVC pipes with “S” Mark Product Certification

- PVC – U Pipes and fittings for drain, waste and vent application - AS/NZS 1260
  License No: 2802, 2365 and 2818
- PVC – Pressure pipes and fittings - AS/NZS 1477
  License No: 2803 and 2381
- PVC – U Pipes and fittings for stormwater and surface water application - AS/NZS 1254
  License No: 2801 and 2725
- Conduits systems for cable management - AS/NZS 61386 Part 21
  License No: 2806 and 2755
- Conduits and fittings for electrical installations – AS/NZS 2053
  License No: 2297

RXP also complies with Best Environmental Practice (BEP) certification for its PVC products and systems – Certificate issued by the Vinyl Council Australia (Lic No. 0067)

Product information

Table 1 - Product characteristics of PVC pipes

	PRODUCT CHARACTERISTICS

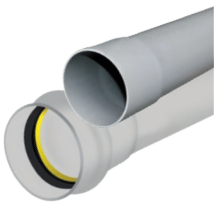
Product names/Application	Polyvinylchloride (PVC) pipes covered in this EPD are:
	- Polyvinylchloride (PVC) non-pressure pipe
	  - Drainage, Waste & Ventilation (DWV)
	  - Electrical/Communication Conduit
	  - Stormwater
	- Polyvinylchloride (PVC) pressure pipe
	  - Water supply

UN CPC Code	369 – Other plastic products
Density	1,400-1,500 kg/m3
Ultimate tensile strength	40 - 52MPa
Shore D hardness	80
Coefficient of linear thermal expansion	7×10^{-5} / °C
Vicat softening temperature	74 - 82 °C
Poissons ratio	0.4
Stiffness modulus	2,800 – 3,300 MPa

All products specifications can be found in Appendix B.

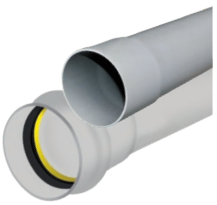
Table 2. PVC Non-pressure pipes included in EPD

PRODUCT SERIES	RXP'S PRODUCTS
100	Drain, Waste and Vent – Sewer Lock
550	Culvert pipe
700	Stormwater– Storm-Lock™
2700	Electrical Duct



Drain, Waste and Vent – Sewer Lock

Culvert pipe

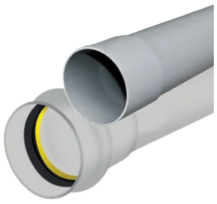


Stormwater– Storm-Lock™

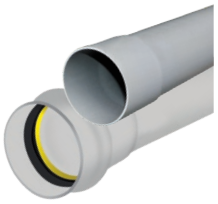
Electrical Duct

Table 3. PVC Pressure pipes included in EPD

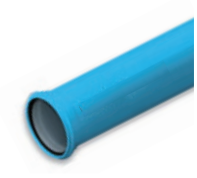
PRODUCT SERIES	RXP'S PRODUCTS
800 - Small	Water Supply – Power Lock™
800 - Large	Water Supply – Power Lock™
1850	Water Supply



Water Supply – Power Lock™



Water Supply – Power Lock™



Water Supply

Table 4 - Content declaration for representative PVC products

Product components	Post-consumer material, weight -%		CAS #
	PVC Pressure pipe	PVC non-pressure pipe	
PVC resin	94%	80-81%	9002-86-2
Stabilisers	<0.5%	<0.5%	Mixture, confidential
Lubricants	2-2.5%	2-2.5%	Mixture, confidential
Acrylic process aids and impact modifiers	x	x	Mixture, confidential
Filler (calcium carbonate)	2%	15-17%	1317-65-3
Titanium dioxide	1.40%	1.20%	13463-67-7
Other pigments	<0.5%	<0.5%	Various
Packaging materials	**Weight -% (versus the product)**		
	PVC Pressure pipe	PVC non-pressure pipe	
Softwood	< 0.1%	< 0.1%	
PET Strapping	< 0.1%	< 0.1%	

Product life cycle overview

The life cycle of a building product is divided into three process modules according to the General Program Instructions (GPI) and four information modules according to ISO 21930 and EN 15804 and supplemented by an **optional** information module on potential loads and benefits beyond the building life cycle. Table 5 shows the system boundary and scope of the EPD.

The scope of this EPD is "Cradle to Gate" with module C1–C4, module D and **optional** modules A4-A5.
Due to the durability of PVC pipes, and lack of planned or required maintenance throughout the service life, modules B1-B7 were deemed not relevant (of negligible impact).

Table 5 - Scope of assessment and system boundary for PVC non pressure and pressure pipes

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	X
Geography	Global/ NZ	NZ	NZ	NZ	NZ								NZ	NZ	NZ	NZ	NZ

X = module included in EPD

MND= Module not declared (does not indicate zero impact result)

System diagram

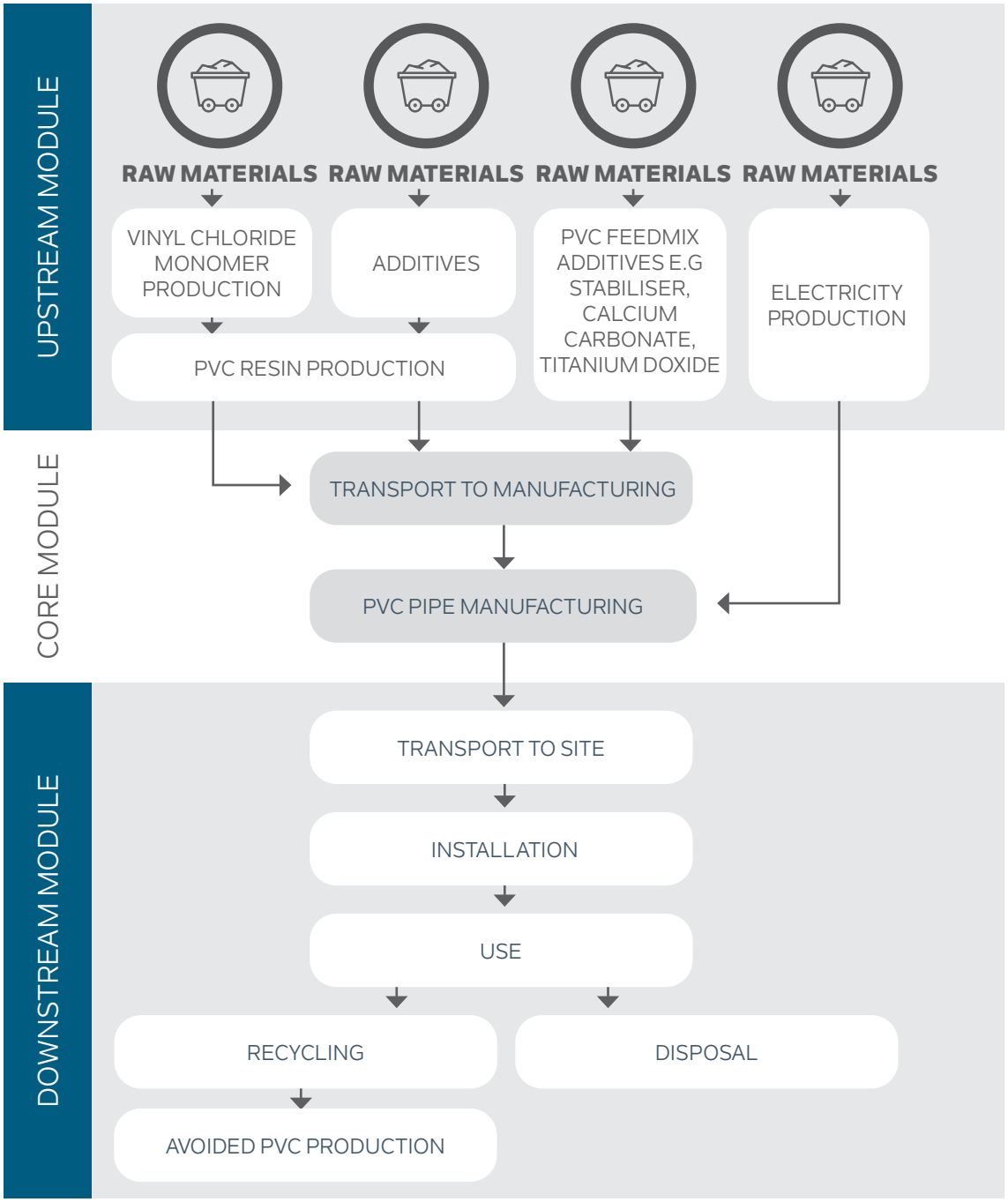


Figure 1. Life cycle diagram of PVC – non pressure pipe production

Manufacturing Stage

RXP PVC pipes are manufactured in two sites:

- Manurewa, Auckland - North Island
- Tinwald, Ashburton - South Island

The plastics PVC pipes are produced using extrusion technology and process that is sophisticated and highly controlled.

Basically, PVC products are formed from raw PVC resin by a process of heat and pressure, additional materials used are additives, including calcium carbonate, titanium dioxide, calcium-based stabiliser, lubricants, and pigments.

The PVC resin is the main ingredient in the PVC pipe feed mix but internal PVC pipe scrap from production can be fed back into the feed mix to ensure wastage is minimised.

The heart of the process is the extruder where the PVC passes through a number of zones which compress, homogenise and vent the melt stream. The final zone increases the pressure to extrude the melt through the head and die set.

Once the pipe leaves the extrusion die, it is sized by external vacuum, final cooling is done in a controlled water bath.

An in-line printer marks the pipes at regular intervals, with identification according to size, class, type and date. An automatic cut-off saw cuts the pipe to the required length.

The final part of the process of manufacturing a PVC is to create a socket so the lengths can be joined. The is done automatically in line with the extrusion process where the cut length is passed into the socketing machine where on end of the pipe is re-heated and shaped over a mandrel to make a solvent socket or rubber ring socket to allow the pipes to be joined together in the field.

Finally, the lengths of pipe are palletised, packaged with a softwood timber frame, and PET strapping.

Distribution Stage

RXP distributes to New Zealand's major markets. Figures for this stage were calculated with a weighted average based on volume production in each manufacturing sites and the distribution centres for each of the different products.

An average distance of 30kms was assumed from manufacturing site to distribution centres, products transported via rigid truck.

Installation Stage

PVC pipes with a small diameter are typically used above ground. In residential applications, these are located in wall and floor cavities and for commercial and industrial applications they are often left exposed suspended from floor and ceiling surfaces. The smaller pipes are carried by person, cut by hand saw and positioned by hand – no machinery being required.

Larger sizes are typically buried to connect the building to the sewer or stormwater drainage infrastructure provided by water and council agencies.

Generally and depending on the scenario, pipes with a DN >80mm and ≤100mm (for non-pressure pipe) or 50mm (for pressure pipe) are generally laid in excavated trenches. The depth of the trench varies and pipes require a 600mm deep trench and a width of twice the pipe diameter. It is assumed that a compact track loader with a trench cutter attachment is used to install these pipes.

Pipes with DN>100 require a trench depth of 750 mm plus the pipe's height and a width based on the values shown in Figure 2. It is assumed that the trenches are done by using a mechanical excavator. .

Recommended Trench Widths

Size DN	Minimum (mm)	Maximum (mm)
100	320	800
125	340	825
150	360	825
175	400	875
200	425	900
225	450	925
300	515	1000
375	600	1200

Minimum Cover

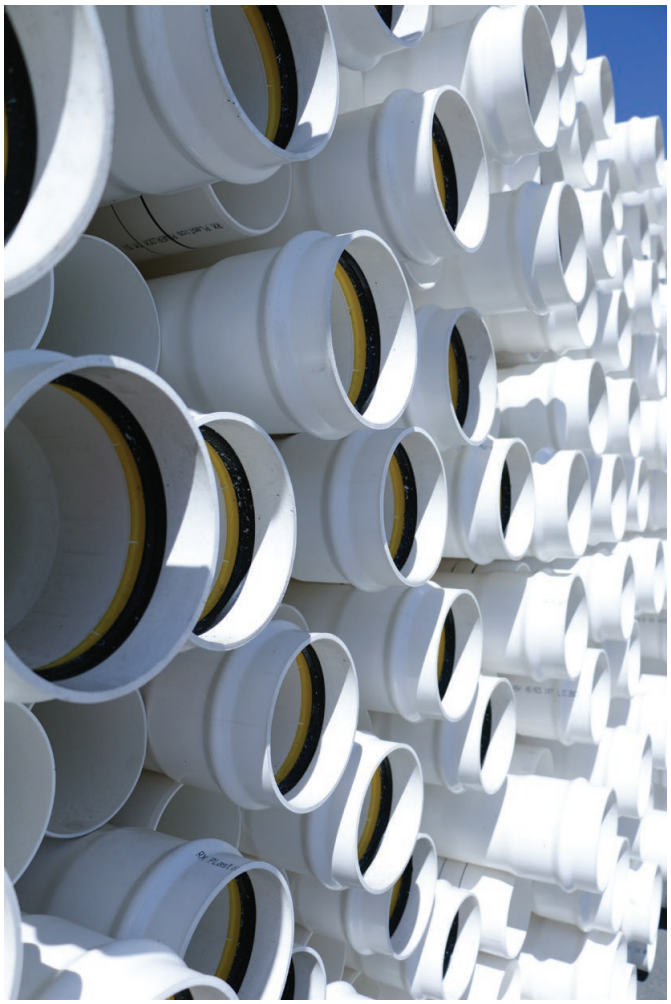
Loading	Cover (mm)
Roads and streets	750
Driveways and similar areas subject to traffic	600
Footpaths, gardens	500
Construction traffic	750

Figure 2. Recommended trench width and minimum cover.

Use Stage

Maintenance of the pipe systems is not required and not planned. These systems are designed to outlast the building with a life expectancy of in excess of 100 years and as access to these in a finished building is limited given their location in floor slabs or behind finished walls and ceilings. The failure rate is also extremely low and is considered to be inconsequential (not relevant) in this EPD. Post installation problems, if any, tend to be linked to 3rd party damage such as inadvertently drilling through pipes behind ceiling and wall finishes.

Apart from PVC pipes containing lead stabilisers (RXP does not use any lead stabilisers in any of its PVC products) there there's no release of dangerous substances to indoor air, soil and water during the use stage (European Commission, 2004).



End of life Stage

PVC pipe products in this LCA study have an anticipated service life in excess of 100 years, research conducted by PIPA has revealed very little waste PVC pipe product from demolition sites is finding its way to landfill. In the decades ahead, this situation may change but for now most PVC pipe entering the waste stream is short offcut pieces and surplus unused new product.

The resin used in the manufacture of PVC pipe and fittings is 100% recyclable and a viable resource that deserves a second life. Aliaxis is committed to minimising waste and RXP and Marley have achieved Best Environmental Practise certification. Following the use of the pipe, Aliaxis has limited empirical evidence of what the end-of-life fate is for PVC pipes. Pipes are often embedded in concrete slab and other construction material which is difficult to separate at deconstruction.

The PVC pressure pipes are installed underground and are assumed to remain underground at end of life. The PVC pipes are inert and there is no incentive to dig them up to send for waste treatment.

As for the PVC non pressure pipes extracted at the end of life, technically, all offcuts can be completely recycled back into new pipe products. As part of a nationwide pipe recycling programme in New Zealand, clean PVC plastic pipe can be delivered free-of-charge to recycling drop-off locations in Auckland, Hamilton, Christchurch, and Ashburton to the three main PVC Pipe Manufacturers across New Zealand, two of which are Marley and RXP. In addition to these sites, specifically recycling PVC pipe, there are general plastics recyclers in all capital cities. According to Plastics New Zealand, any recycling of commercial PVC is happening within NZ at one of the 3-4 commercial processors or internally within the manufacturing companies. Consumer Waste of PVC is still baled as part of 3 – 7 mixed plastics which at this stage is either being sent offshore or landfilled, however no waste data is collected with sufficient detail in New Zealand.

Due to a lack of national data on PVC pipe recycling, recycling rates were calculated by using best estimates for PVC pipe waste generation and recycling in NSW. Based on estimates by the former Department of Environment and Climate Change (DECC) and subsequent discussions with PIPA, it was estimated that there is approximately 1,300 tonnes of PVC pipe entering the waste stream each year in NSW. The current amount of PVC pipe recycled in NSW is approximately 350 tonnes, giving a recycling rate of 26.9%. Due to the uncertainty in this number and the difference in geographical area, a sensitivity analysis was carried out (see section End of Life Recycling Rate).

Figure 3. RXP PVC pipe manufacturing sites and showing modules related to the EPD

Life Cycle Assessment Methodology

This section includes the main details of the LCA study as well as assumptions and methods of the assessment. A summary of the key life cycle assessment parameters is given in Table 8.

Life cycle impact assessment methods used: based on EN 15804 +A2

Table 6 - Details of LCA

Declared unit	1 kg of installed pipe
Geographical coverage	New Zealand
LCA scope	Cradle to gate with module C1–C4, module D and optional modules A4-A5
Reference service life	100 years - While the design life of the PVC pipe is in excess of 100 years, the duration of the pipe use in buildings will be less for buildings with a shorter lifetime

Life cycle thinking is a core concept in sustainable consumption and production for policy and business. Upstream and downstream consequences of decisions must be taken into account to help avoid the shifting of burdens from one type of environmental impact to another, from one political region to another, or from one stage to another in a product's life cycle from the cradle to the grave.

LCA is the compilation of the inputs, outputs and environmental impacts of a product system throughout its life cycle. It is a technique that enables industries to identify the resource flows and environmental impacts (such as greenhouse gas emissions, water and energy use) associated with the provision of products and services.

According to EN 15804, EPDs of construction products may not be comparable if they do not comply with this standard, and EPDs might not be comparable, particularly if different functional units are used.

Core data collection

Life cycle data has been sourced from material quantity data and production process data from:

- RXP's reporting systems and staff
- RXP feeds mix suppliers
- Core manufacturing data was collected directly from RXP manufacturing sites.
  Electricity consumption was allocated to pipe via mass of pipe produced

Background data

Generic background data was sourced for raw materials in the upstream module, transportation and end of life waste treatment. Background data was adapted to represent RXP PVC pipes product as accurately as possible.

Database(s) and LCA software used:
The inventory data for the process are entered into the SimaPro (v9.1.1.1) LCA software program and linked to the pre-existing data for the upstream feedstocks and services selected in order of preference from:

- Life cycle inventory ecoinvent 3.5, adapted where relevant to New Zealand conditions (energy sources, transport distances and modes and so on, and documented to show how the data is adapted for national relevance).
- The Australasian Unit Process LCI compiled by Life Cycle Strategies (Life Cycle Strategies, 2015).
- Other sources with sensitivity analysis reported to show the significance of this data for the results and conclusions drawn.

All background data used was less than 10 years old.

Data quality and validation

Edge Environment has used the following criteria in selecting data for modelling:

- **Relevance:** Select sources, data, and methods appropriate to assessing the chosen product's LCI,
- **Completeness**: Include all LCI items that provide a material's contribution to a product's life cycle emissions,
- **Consistency:** Enable meaningful comparisons in life cycle impact assessment (LCIA) information,
- Accuracy: reduce bias and uncertainty as far as is practical,
- **Transparency:** When communicating, disclose enough information to allow third parties to make decisions,
- **Time coverage:** The data collected represents recent practice for the construction of the project, and
- **Geographical coverage:** The data collected are representative of the sourcing of materials, whether from New Zealand or overseas, and are in line with the goal of the study.

Cut-off rules

According to the PCR 2019:14, Life cycle inventory data shall according to EN 15804 A2 include a minimum of 95% of total inflows (mass and energy) per module. Inflows not included in the LCA shall be documented in the EPD. In accordance with the PCR 2019:14, the following system boundaries are applied to manufacturing equipment and employees:

- Environmental impact from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the LCI. Capital equipment and buildings typically account for less than a few percent of nearly all LCIs and this is usually smaller than the error in the inventory data itself. For this project, it is assumed that capital equipment makes a negligible contribution to the impacts as per Frischknecht et al. (2007) with no further investigation.
- Personnel-related impacts, such as transportation to and from work, are also not accounted for in the LCI. The impacts of employees are also excluded from inventory impacts on the basis that if they were not employed for this production or service function, they would be employed for another. It is very hard to decide what proportion of the impacts from their whole lives should count towards their employment. For this project, the impacts of employees are excluded.

Allocation

Allocation was carried out in accordance with the PCR (EPD International, 2019), section 4.5. No-allocation between co-products in the core module as there were no co-products created during manufacturing. Energy consumed in core module was allocated to pipe via mass of pipe produced.

PVC Pipe Environmental Performance

Environmental Indicators

The potential environmental impacts used in this EPD are explained in Table 9

Table 7 - Environmental indicators used in the EPD

	Impact category	Abbreviation	Unit	Definition	Disclaimer
Environmental impacts	Global warming potential - Fossil	GWP - F	kg CO_2 eq.	Estimates GHG warming effect for fossil, given as kgCO_2-eq.	
	Global warming potential - Biogenic	GWP - B	kg CO_2 eq.	Estimates GHG warming effect for biogenic, given as kgCO_2-eq.	
	Global warming potential - Land use and Land use change	GWP - Luluc	kg CO_2 eq.	Estimates GHG warming effect for land use and land use change, given as kgCO_2-eq.	
	Global warming potential - Total	GWP - T	kg CO_2 eq.	Estimates the total GHG warming effect, given as kgCO_2-eq.	
	Ozone depletion potential	ODP	kg CFC 11 eq.	Estimates the potential reduction of ozone in Earth's atmosphere as per CFC-11 eq effects.	
	Acidification potential	AP	mol H^+ eq.	Estimates the increase of oceans acidity as per SO_2 eq effects.	
	Eutrophication, freshwater	EP - F	kg PO_4^{3-} eq.	Estimates the potential increment of nutrients in freshwater as kg PO_4 effects.	
	Eutrophication, freshwater	EP - F2	kg P eq.	Estimates the potential increment of nutrients in freshwater as kg P equivalent effects.	
	Eutrophication, marine	EP - M	kg N eq.	Estimates the potential increment of nutrients in marine water as kg N equivalent effects.	
	Eutrophication, terrestrial	EP – T	mol N eq.	Estimates the potential increment of nutrients in land as mol N equivalent effects.	
	Photochemical ozone formation	POCP	kg NMVOC eq.	Estimates photochemical smog (air pollution) potential as kg C_2H_4 eq	2
	Abiotic depletion potential - minerals and metals	ADP	kg Sb eq.	Estimates the impact on minerals reserves as antimony (Sb) equivalents	2
	Abiotic depletion potential - Fossil	ADP - F	MJ	Estimates the impact on fossil fuels reserves as MJ	
	Water depletion Potential	WDP	m^3 eq.	Estimates the potential of water deprivation, to either humans or ecosystems, and serves in calculating the impact score of water consumption at midpoint in LCA or to calculate a water scarcity footprint as per ISO 14046.	2

Table 7 - Environmental indicators used in the EPD continued

	Impact category	Abbreviation	Unit	Definition	Disclaimer
Resource use	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ	Estimates the use of renewable primary energy excluding renewable primary energy resources used as raw materials	
	Use of renewable primary energy resources used as raw materials	PERM	MJ	Estimates the use of renewable primary energy resources used as raw materials	
	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ	Estimates the total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	
	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ	Estimates the use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	
	Use of non- renewable primary energy resources used as raw materials	PENRM	MJ	Estimates the use of non- renewable primary energy resources used as raw materials	
	Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ	Estimates the total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials)	
	Use of secondary material	SM	kg	Estimates the use of secondary material	
	Use of renewable secondary fuels	RSF	MJ	Estimates the use of renewable secondary fuels	
	Use of non-renewable secondary fuels	NRSF	MJ	Estimates the use of non-renewable secondary fuels	
	Use of net fresh water	FW	m^3	Estimates the use of net fresh water	
Waste	Hazardous waste disposed	HWD	kg	Estimates the hazardous waste disposed	
	Non-hazardous waste disposed	NHWD	kg	Estimates the non-hazardous waste disposed	
	Radioactive waste disposed/ stored	RWD	kg	Estimates the radioactive waste disposed/stored	

Table 7 - Environmental indicators used in the EPD continued

	Impact category	Abbreviation	Unit	Definition	Disclaimer
Output flows	Components for re-use	CFR	kg	Estimates the components for re-use	
	Material for recycling	MFR	kg	Estimates the material for recycling	
	Materials for energy recovery	MFEE	kg	Estimates the materials for energy recovery	
	Exported energy, electricity	EE - e	MJ	Estimates the exported energy, electricity	
	Exported energy, thermal	EE - t	MJ	Estimates the exported energy, thermal	
Additional environmental impact indicators	Global warming potential, excluding biogenic uptake, emissions and storage	GWP - GHG	kg CO_2 eq. (GWP100)	Estimates GHG warming effect for a change in a 100 years time, given as CO_2-eq.	
	Particulate matter	PM	disease incidence	Estimates the potential incidence of disease due to PM emissions	
	Ionising radiation - human health	IRP	kBq U-235 eq	Estimates the potential health damages related to the man-made routine releases of radioactive material to the environment	1
	Eco-toxicity, freshwater	ETP - fw	CTUe	Estimates the potential impact on fresh water ecosystems, as a result of emissions of toxic substances to air, water and soil.	2
	Human toxicity potential - cancer effects	HTP - c	CTUh	Estimates the potential Comparative Toxic Unit for humans - cancer	2
	Human toxicity potential - non cancer effects	HTP - nc	CTUh	Estimates the potential Comparative Toxic Unit for humans - non cancer	2
	Soil quality	SQP	dimensionless	Estimates the potential soil quality index (SQP)	2
	Biogenic content	Biogenic Content	Kg C	Estimated the amount of carbon that is stored in biological materials, such as plants or soil	

Disclaimer 1: This impact category deals mainly with the eventual impact of low dose ionizing nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Results: Environmental information

The following section provides the environmental impact results produced by the LCA. Results are not presented as a weighted average of all products (results for all products were calculated individually) due to the results variation being greater than ±10% in some cases.

In this section, only the results of the most representative product of each product category are presented. The results for all remaining products can be found in the appendix A.

To calculate the total environmental impact for a specific product and nominal diameter (DN), the values for each module must be added.

In the case of A5, the value of the column where the range of the DN is included should be divided by the weight of the product (found in Appendix B) due to this value being presented per metre of pipe installed.

The total impact is the sum of the following parts:

- Value shown in A1-3
- Value of module A4
- A5: value of the column where the range of the DN is included divided by the weight of the product due to this value being presented per metre of pipe installed.
- C1-4: The four columns correspondent to module C (C1-C4)
- The value of column Module D

EPD Results - PVC non-pressure

Results for modules A1-4, C - D

Table 8. Results for 1kg of Series 100 - DWV

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Environmental impacts	GWP-fossil	kg CO_2 eq.	2.38E+00	1.68E-01	5.24E-05	5.20E-03	-2.33E-01	3.65E-01	-5.42E-01
	GWP-biogenic	kg CO_2 eq.	-1.78E-02	3.52E-04	1.78E-09	1.09E-05	-8.10E-03	4.20E-04	-2.68E-03
	GWP-luluc	kg CO_2 eq.	2.20E-03	6.88E-05	7.24E-13	2.13E-06	-5.77E-04	2.44E-05	-6.00E-04
	GWP-total	kg CO_2 eq.	2.36E+00	1.68E-01	5.24E-05	5.22E-03	-2.42E-01	3.66E-01	-5.45E-01
	ODP	kg CFC 11 eq.	9.63E-07	3.73E-08	7.67E-15	1.16E-09	-6.21E-08	6.04E-09	-2.41E-07
	AP	mol H^+ eq.	1.19E-02	1.16E-03	4.64E-07	3.53E-05	-4.56E-03	3.08E-04	-2.58E-03
	EP-freshwater	kg PO_4^{3-} eq.	2.98E-03	1.87E-04	6.82E-08	5.78E-06	6.15E-06	1.45E-04	-6.54E-04
	EP-freshwater	kg P eq.	7.00E-04	1.27E-05	3.91E-11	3.93E-07	2.27E-06	7.54E-06	-1.52E-04
	EP-marine	kg N eq.	2.34E-03	4.39E-04	2.02E-07	1.35E-05	9.16E-05	2.96E-04	-5.20E-04
	EP-terrestrial	mol N eq.	2.35E-02	4.81E-03	2.20E-06	1.48E-04	1.27E-03	1.16E-03	-5.33E-03
	POCP	kg NMVOC eq.	6.22E-03	1.16E-03	5.75E-07	3.59E-05	-1.16E-04	5.66E-04	-1.35E-03
	ADP-minerals&metals*	kg Sb eq.	3.54E-05	5.70E-07	1.19E-12	1.78E-08	3.06E-07	1.87E-07	-7.84E-06
	ADP-fossil*	MJ	4.81E+01	2.50E+00	1.93E-05	7.74E-02	-1.04E+01	3.12E-01	-1.15E+01
	WDP	m^3	2.00E+00	8.31E-03	2.70E-05	2.58E-04	-1.12E+01	2.41E-01	-3.67E-01
Resource use	PERE	MJ	4.54E+00	2.88E-02	4.54E-07	8.86E-04	-3.09E-02	2.42E-02	-4.28E-01
	PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERT	MJ	4.54E+00	2.88E-02	4.54E-07	8.86E-04	-3.09E-02	2.42E-02	-4.28E-01
	PENRE	MJ	5.17E+01	2.65E+00	1.94E-05	8.22E-02	-1.12E+01	3.32E-01	-1.23E+01
	PENRM	MJ	3.26E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRT	MJ	8.42E+01	2.65E+00	1.94E-05	8.22E-02	-1.12E+01	3.32E-01	-1.23E+01
	SM	kg	0.00E+00	0.00E+00	0.00E+00	1.00E+00	2.00E+00	3.00E+00	4.00E+00
	RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	FW	m^3	1.87E-02	1.24E-04	3.59E-09	3.84E-06	3.86E-04	3.39E-03	-4.28E-03
Waste	Hazardous waste disposed	kg	3.36E-05	6.48E-06	5.29E-12	2.02E-07	4.87E-07	6.22E-07	-7.67E-06
	Non-hazardous waste disposed	kg	3.73E-01	1.25E-01	7.31E-08	3.90E-03	5.87E-02	4.94E-02	-7.91E-02
	Radioactive waste disposed	kg	6.43E-05	1.62E-05	5.91E-14	5.03E-07	1.72E-09	1.64E-06	-1.57E-05
Output flows	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-01	0.00E+00	0.00E+00
	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Additional environmental impacts	GWP-GHG	kg CO_2 eq.	2.28E+00	1.66E-01	5.18E-05	5.15E-03	-2.11E-01	3.36E-01	-5.20E-01
	Particulate matter	disease incidence	9.24E-08	1.67E-08	1.31E-12	5.20E-10	-2.65E-08	-2.60E-08	4.27E-06
	Ionising radiation - human health	kBq U-235 eq	1.51E-01	1.14E-02	4.09E-10	3.53E-04	1.04E-05	3.63E-04	2.00E-03
	Eco-toxicity (freshwater)	CTUe	5.14E+01	2.16E+00	1.27E-03	6.72E-02	-7.80E+00	-7.73E+00	2.02E+01
	Human toxicity potential - cancer effects	CTUh	1.65E-09	1.02E-10	1.03E-14	3.17E-12	-5.26E-11	-4.95E-11	1.12E-07
	Human toxicity potential -non cancer effects	CTUh	4.33E-08	2.51E-09	7.02E-13	7.81E-11	-7.14E-09	-7.06E-09	2.18E-08
	Soil quality	dimensionless	1.01E+01	1.74E+00	3.21E-06	5.42E-02	1.56E+00	1.61E+00	3.56E-01

	Indicator	Unit	Quantity
Biogenic content	Biogenic carbon content in product	kg C	0.00E+00
	Biogenic carbon content in packaging	kg C	6.53E-03

Results for modules A5

Table 9 shows the results(A5) for PVC non- pressure pipes ranges 20 to 500. The significantly lower impact for the first range (DN=40) is due to pipes of this size range not being buried, and therefore not requiring excavation and fill which account for the highest impact in the installation stage.

Table 9. EPD Results for 1m of installed PVC non-pressure pie

			DN and DN range (mm)							
	Indicator	Unit	40	90	110	160	225	315	400	500
			20-80	90	100-110	150-176	200-250	300-315	375-400	475-500
Environmental impacts	GWP-fossil	kg CO_2 eq.	7.56E-03	2.23E+00	9.45E+00	1.08E+01	1.37E+01	1.65E+01	2.04E+01	2.44E+01
	GWP-biogenic	kg CO_2 eq.	4.85E-05	1.38E-02	4.99E-02	5.76E-02	7.36E-02	8.83E-02	1.09E-01	1.29E-01
	GWP-luluc	kg CO_2 eq.	1.07E-06	1.33E-03	4.79E-03	5.53E-03	7.07E-03	8.47E-03	1.04E-02	1.24E-02
	GWP-total	kg CO_2 eq.	7.60E-03	2.25E+00	9.50E+00	1.09E+01	1.37E+01	1.65E+01	2.05E+01	2.46E+01
	ODP	kg CFC 11 eq.	2.36E-10	2.45E-07	8.83E-07	1.02E-06	1.31E-06	1.57E-06	1.93E-06	2.30E-06
	AP	mol H^+ eq.	1.44E-05	1.67E-02	7.27E-02	8.27E-02	1.04E-01	1.25E-01	1.55E-01	1.86E-01
	EP-freshwater	kg PO_4^{3-} eq.	4.27E-06	3.31E-03	1.38E-02	1.57E-02	1.99E-02	2.39E-02	2.96E-02	3.54E-02
	EP-freshwater	kg P eq.	6.29E-07	4.21E-04	1.52E-03	1.75E-03	2.24E-03	2.69E-03	3.32E-03	3.94E-03
	EP-marine	kg N eq.	5.93E-06	5.83E-03	2.65E-02	3.00E-02	3.78E-02	4.55E-02	5.61E-02	6.75E-02
	EP-terrestrial	mol N eq.	3.40E-05	6.47E-02	2.93E-01	3.32E-01	4.18E-01	5.03E-01	6.20E-01	7.46E-01
	POCP	kg NMVOC eq.	1.34E-05	1.61E-02	7.35E-02	8.34E-02	1.05E-01	1.26E-01	1.56E-01	1.87E-01
	ADP-minerals & metals*	kg Sb eq.	2.30E-08	1.01E-05	3.65E-05	4.21E-05	5.39E-05	6.48E-05	7.99E-05	9.50E-05
	ADP-fossil*	MJ	5.79E-02	2.28E+01	8.25E+01	9.53E+01	1.22E+02	1.47E+02	1.81E+02	2.16E+02
	WDP	m^3	4.50E-03	1.50E+00	6.11E+00	7.00E+00	8.89E+00	1.07E+01	1.32E+01	1.58E+01
Resource use	PERE	MJ	1.06E-02	1.06E+00	3.82E+00	4.41E+00	5.64E+00	6.77E+00	8.34E+00	9.90E+00
	PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERT	MJ	1.06E-02	1.06E+00	3.82E+00	4.41E+00	5.64E+00	6.77E+00	8.34E+00	9.90E+00
	PENRE	MJ	6.23E-02	2.42E+01	8.75E+01	1.01E+02	1.29E+02	1.56E+02	1.92E+02	2.29E+02
	PENRM	MJ	0.00E+00	6.24E+01	9.32E+01	1.97E+02	3.90E+02	7.64E+02	1.23E+03	1.93E+03
	PENRT	MJ	6.23E-02	8.66E+01	1.81E+02	2.98E+02	5.19E+02	9.20E+02	1.42E+03	2.15E+03
	SM	kg	0.00E+00	1.00E+00	2.00E+00	3.00E+00	4.00E+00	5.00E+00	6.00E+00	7.00E+00
	RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	FW	m^3	6.24E-05	1.62E-02	5.81E-02	6.73E-02	8.62E-02	1.04E-01	1.28E-01	1.53E-01
Waste	Hazardous waste disposed	kg	3.47E-08	7.75E-05	2.80E-04	3.23E-04	4.13E-04	4.95E-04	6.10E-04	7.23E-04
	Non-hazardous waste disposed	kg	8.89E-04	8.30E-01	3.00E+00	3.46E+00	4.42E+00	5.30E+00	6.54E+00	7.76E+00
	Radioactive waste disposed	kg	7.62E-08	1.32E-04	4.77E-04	5.51E-04	7.05E-04	8.45E-04	1.04E-03	1.24E-03

	Indicator	Unit	DN and DN range (mm)							
			40	90	110	160	225	315	400	500
			20-80	90	100-110	150-176	200-250	300-315	375-400	475-500
Output flows	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Additional environmental impacts	GWP-GHG	kg CO_2 eq.	7.00E-03	2.20E+00	9.29E+00	1.06E+01	1.34E+01	1.62E+01	2.00E+01	2.40E+01
	Particulate matter	disease incidence	6.22E-08	3.27E-07	8.73E-07	1.25E-06	1.87E-06	2.71E-06	4.08E-06	5.48E-06
	Ionising radiation - human health	kBq U-235 eq	1.04E-04	2.05E-01	7.38E-01	8.52E-01	1.09E+00	1.31E+00	1.61E+00	1.91E+00
	Eco-toxicity (freshwater)	CTUe	3.39E-01	4.04E+01	1.78E+02	2.04E+02	2.58E+02	3.13E+02	3.89E+02	4.71E+02
	Human toxicity potential - cancer effects	CTUh	1.63E-09	6.05E-09	1.31E-08	2.15E-08	3.49E-08	5.38E-08	8.59E-08	1.18E-07
	Human toxicity potential - non cancer effects	CTUh	3.39E-10	3.44E-08	1.41E-07	1.63E-07	2.07E-07	2.51E-07	3.14E-07	3.79E-07
	Soil quality	dimensionless	1.08E-02	2.65E+01	9.56E+01	1.10E+02	1.41E+02	1.69E+02	2.08E+02	2.47E+02

EPD Results - PVC pressure

Results for modules A1-4, C-D

Table 10. EPD results for 1 kg of Series 800 - Large

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Environmental impacts	GWP-fossil	kg CO_2 eq.	2.66E+00	5.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-biogenic	kg CO_2 eq.	1.72E-02	1.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-luluc	kg CO_2 eq.	2.45E-03	2.20E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-total	kg CO_2 eq.	2.68E+00	5.40E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ODP	kg CFC 11 eq.	1.11E-06	1.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	AP	mol H^+ eq.	1.28E-02	3.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-freshwater	kg PO_4^{3-} eq.	3.32E-03	6.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-freshwater	kg P eq.	7.91E-04	4.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-marine	kg N eq.	2.51E-03	1.41E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-terrestrial	mol N eq.	2.50E-02	1.54E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	POCP	kg NMVOC eq.	6.61E-03	3.73E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ADP-minerals&metals*	kg Sb eq.	3.87E-05	1.83E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ADP-fossil*	MJ	5.48E+01	8.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	WDP	m^3	2.23E+00	2.67E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Resource use	PERE	MJ	4.37E+00	9.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERT	MJ	4.37E+00	9.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRE	MJ	5.89E+01	8.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRM	MJ	3.81E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRT	MJ	9.69E+01	8.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	FW	m^3	2.13E-02	3.97E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste	Hazardous waste disposed	kg	3.71E-05	2.08E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Non-hazardous waste disposed	kg	4.05E-01	4.02E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Radioactive waste disposed	kg	6.99E-05	5.20E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Output flows	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00+00	0.00E+00	0.00E+00
	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Additional environmental impacts	GWP-GHG	kg CO_2 eq.	2.55E+00	5.32E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Particulate matter	disease incidence	1.02E-07	5.36E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Ionising radiation - human health	kBq U-235 eq	1.71E-01	3.65E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Eco-toxicity (freshwater)	CTUe	5.49E+01	6.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Human toxicity potential - cancer effects	CTUh	1.82E-09	3.28E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Human toxicity potential -non cancer effects	CTUh	4.78E-08	8.06E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Soil quality	dimensionless	8.47E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Indicator	Unit	Quantity
Biogenic content	Biogenic carbon content in product	kg C	0.00E+00
	Biogenic carbon content in packaging	kg C	3.17E-03

Results for modules A5

Table 11. EPD results for 1m of installed PVC pressure pipe

			DN and DN range (mm)								
	Indicator	Unit	25	100	125	150	175	225	300	375	450
			15-80	100	125	150	175	200-250	300	375	450
Environmental impacts	GWP-fossil	kg CO_2 eq.	3.74E-03	2.43E+00	1.01E+01	1.06E+01	1.19E+01	1.36E+01	1.62E+01	4.41E+02	2.22E+01
	GWP-biogenic	kg CO_2 eq.	3.67E-05	1.56E-02	5.35E-02	5.68E-02	6.38E-02	7.36E-02	8.76E-02	4.88E+00	1.19E-01
	GWP-luluc	kg CO_2 eq.	7.95E-07	1.50E-03	5.13E-03	5.45E-03	6.12E-03	7.06E-03	8.41E-03	4.40E-01	1.14E-02
	GWP-total	kg CO_2 eq.	3.78E-03	2.45E+00	1.01E+01	1.07E+01	1.19E+01	1.37E+01	1.63E+01	4.47E+02	2.24E+01
	ODP	kg CFC 11 eq.	1.66E-10	2.77E-07	9.47E-07	1.01E-06	1.13E-06	1.30E-06	1.55E-06	6.05E-05	2.11E-06
	AP	mol H^+ eq.	1.04E-05	1.81E-02	7.75E-02	8.16E-02	9.11E-02	1.04E-01	1.24E-01	3.08E+00	1.70E-01
	EP-freshwater	kg PO_4^{3-} eq.	2.25E-06	3.63E-03	1.47E-02	1.55E-02	1.74E-02	1.99E-02	2.37E-02	7.59E-01	3.24E-02
	EP-freshwater	kg P eq.	3.76E-07	4.76E-04	1.63E-03	1.73E-03	1.94E-03	2.24E-03	2.67E-03	1.47E-01	3.62E-03
	EP-marine	kg N eq.	2.89E-06	6.24E-03	2.82E-02	2.96E-02	3.30E-02	3.78E-02	4.49E-02	8.54E-01	6.16E-02
	EP-terrestrial	mol N eq.	2.12E-05	6.94E-02	3.12E-01	3.28E-01	3.65E-01	4.18E-01	4.97E-01	9.74E+00	6.81E-01
	POCP	kg NMVOC eq.	7.44E-06	1.72E-02	7.82E-02	8.23E-02	9.17E-02	1.05E-01	1.25E-01	2.31E+00	1.71E-01
	ADP-minerals & metals*	kg Sb eq.	1.45E-08	1.14E-05	3.91E-05	4.15E-05	4.67E-05	5.39E-05	6.42E-05	3.30E-03	8.74E-05
	ADP-fossil*	MJ	5.14E-02	2.57E+01	8.85E+01	9.39E+01	1.06E+02	1.22E+02	1.45E+02	6.34E+03	1.98E+02
	WDP	m^3	2.13E-03	1.64E+00	6.52E+00	6.89E+00	7.71E+00	8.86E+00	1.05E+01	4.21E+02	1.44E+01
Resource use	PERE	MJ	1.14E-03	1.19E+00	4.10E+00	4.35E+00	4.89E+00	5.64E+00	6.71E+00	3.70E+02	9.11E+00
	PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERT	MJ	1.14E-03	1.19E+00	4.10E+00	4.35E+00	4.89E+00	5.64E+00	6.71E+00	3.70E+02	9.11E+00
	PENRE	MJ	5.52E-02	2.73E+01	9.39E+01	9.97E+01	1.12E+02	1.29E+02	1.54E+02	6.73E+03	2.10E+02
	PENRM	MJ	0.00E+00	7.70E+01	1.20E+02	1.73E+02	2.36E+02	3.90E+02	6.93E+02	1.95E+03	1.56E+03
	PENRT	MJ	5.52E-02	1.04E+02	2.14E+02	2.73E+02	3.48E+02	5.19E+02	8.48E+02	8.68E+03	1.77E+03
	SM	kg	0.00E+00	1.00E+00	2.00E+00	3.00E+00	4.00E+00	5.00E+00	6.00E+00	7.00E+00	8.00E+00
	RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	FW	m^3	2.90E-05	1.82E-02	6.23E-02	6.61E-02	7.43E-02	8.58E-02	1.02E-01	5.88E+00	1.39E-01
Waste	Hazardous waste disposed	kg	2.41E-08	8.77E-05	3.00E-04	3.18E-04	3.58E-04	4.13E-04	4.91E-04	2.36E-02	6.66E-04
	Non-hazardous waste disposed	kg	3.48E-04	9.39E-01	3.21E+00	3.41E+00	3.83E+00	4.42E+00	5.26E+00	2.06E+02	7.13E+00
	Radioactive waste disposed	kg	5.91E-08	1.50E-04	5.12E-04	5.43E-04	6.10E-04	7.05E-04	8.39E-04	3.61E-02	1.14E-03

	Indicator	Unit	DN and DN range (mm)								
			25	100	125	150	175	225	300	375	450
			15-80	100	125	150	175	200-250	300	375	450
Output flows	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Additional environmental impacts	GWP-GHG	kg CO_2 eq.	3.48E-03	2.39E+00	9.90E+00	1.05E+01	1.17E+01	1.34E+01	1.59E+01	4.32E+02	2.19E+01
	Particulate matter	disease incidence	2.07E-08	3.17E-07	8.36E-07	9.42E-07	1.07E-06	1.35E-06	1.84E-06	3.54E-05	3.35E-06
	Ionising radiation - human health	kBq U-235 eq	8.28E-05	2.31E-01	7.91E-01	8.40E-01	9.44E-01	1.09E+00	1.30E+00	6.72E+01	1.76E+00
	Eco-toxicity (freshwater)	CTUe	1.33E-01	4.33E+01	1.90E+02	2.00E+02	2.23E+02	2.56E+02	3.05E+02	6.92E+03	4.23E+02
	Human toxicity potential - cancer effects	CTUh	5.42E-10	5.50E-09	1.15E-08	1.37E-08	1.56E-08	2.13E-08	3.14E-08	3.78E-07	6.49E-08
	Human toxicity potential - non cancer effects	CTUh	1.22E-10	3.75E-08	1.50E-07	1.59E-07	1.78E-07	2.05E-07	2.45E-07	7.12E-06	3.38E-07
	Soil quality	dimensionless	6.84E-03	2.99E+01	1.03E+02	1.09E+02	1.22E+02	1.41E+02	1.68E+02	8.46E+03	2.27E+02

Interpretation of LCA results

The majority of environmental impact lies within the raw material supplied to RXP manufacturing sites – comparatively little impact is caused by the PVC pipe manufacturing at RXP sites. From the feed mix ingredients, PVC resin is responsible for the majority of all environmental impacts and use of resources, although additives were still found to have a significant impact.

Sensitivity analysis

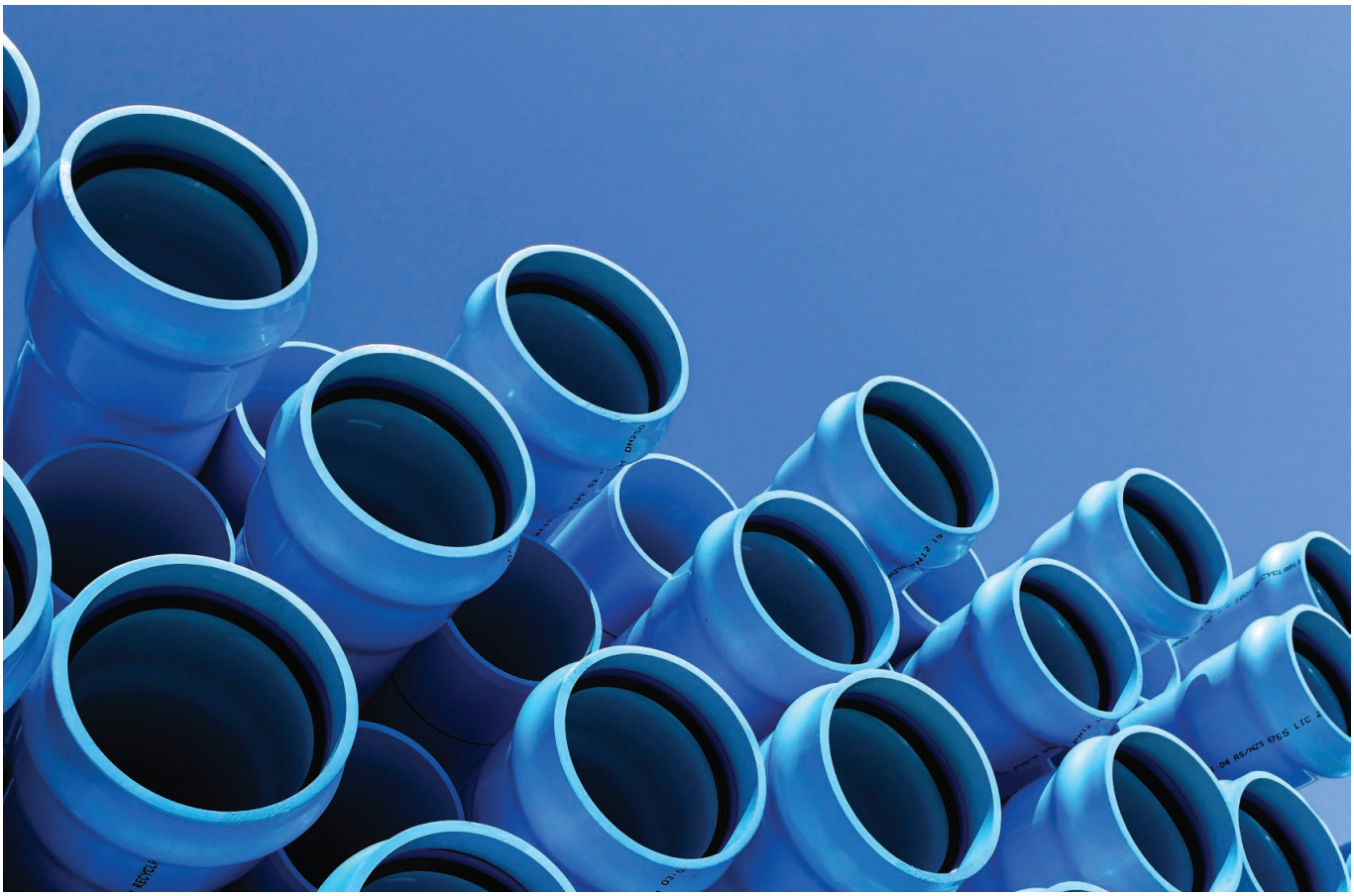
Manufacturing location

As the pipes covered in this study are manufactured in different locations with varying electricity intensities and water consumption, the maximum differences between sites was assessed for each product. However a weighted average was deemed appropriate as the purpose of this EPD is to represent the average RXP PVC pipe product supplied.

Inputs for each product were allocated based on the weight of pipes produced in each site and calculated as a weighted average of the different manufacturing sites where each type of pipe is produced. The background LCA report tested the variation in results between manufacturing locations to assess whether an average of the manufacturing sites can be applied without justification (it's necessary to ensure that the variation in the GWP- GHG impact between sites isn't higher than 10% in modules A1-A3). It was found that none of them differ in more than 10%. This EPD is representative of the average production and is less susceptible to variation when production volumes alter.

End of Life Recycling Rate

The assumption for end-of-life recycling rate was tested using low and high rates based on estimation ranges for PVC pipe in construction and demolition waste stream and current PVC pipe recycling rates. The amount of PVC pipe entering the waste stream is difficult to calculate due to low volumes and only recent targeted separation and collection. Estimates were made and using extremes of both PVC pipe waste and recycling rates gave a low recycling rate of 15.4% and a high of 61.5%. While there is a significant difference in Module D when varying the EOL recycling rate, results are only slightly altered when looking at modules A1-C4.



Additional Environmental Information

MADE USING BEST ENVIRONMENTAL PRACTICE ™

PROUD SUPPORTERS OF CERTIFIED RENEWABLE ELECTRICITY GENERATION

See meridian.co.nz/certified

Best Environmental Practice PVC (BEP PVC)

In 2012 the NZ Green Building Council introduced a PVC credit for manufacturing companies. This credit awards Green Star points for PVC materials that adhere to the best practice guidelines for PVC in the built environment. In short, it means that PVC pipe, downpipe and gutters that meet the BEP criteria can now be specified in New Zealand commercial buildings and go towards gaining credits or points towards the PVC component of the building's overall Green Star rating.

All PVC pipe products made at RX Plastics are now BEP certified and reinforces RX Plastics' environmentally responsible approach across the entire PVC product range.

https://www.rxp.co.nz/wp-content/uploads/2021/06/RXP-BEP-PVC-Licence.pdf

Guidance for PVC Pipe Recycling

Meridian's Energy Certified Renewable Energy Programme

Globally Aliaxis has a goal to reach 100% renewable electricity by 2025 to help reduce the CO^2 emissions by 75% per tonne of production on its sites. Aligned with that goal, in November 2021 RXP joined Meridian Energy's Certified Renewable Energy programme. Meridian is committed to only generating electricity from 100% renewable sources.

Meridian's Certified Renewable Energy product allows RXP to purchase renewable energy certificates to verify that the amount of electricity RXP use from the grid is matched on an annual basis with electricity produced from Meridian's certified hydro stations and wind farms.

Committing to this programme enables Marley to report our Scope 2 electricity emissions as zero, using the market-based reporting methodology as per the GHG Protocol's Scope 2 Standards.

Module D – Recyclability Potentials

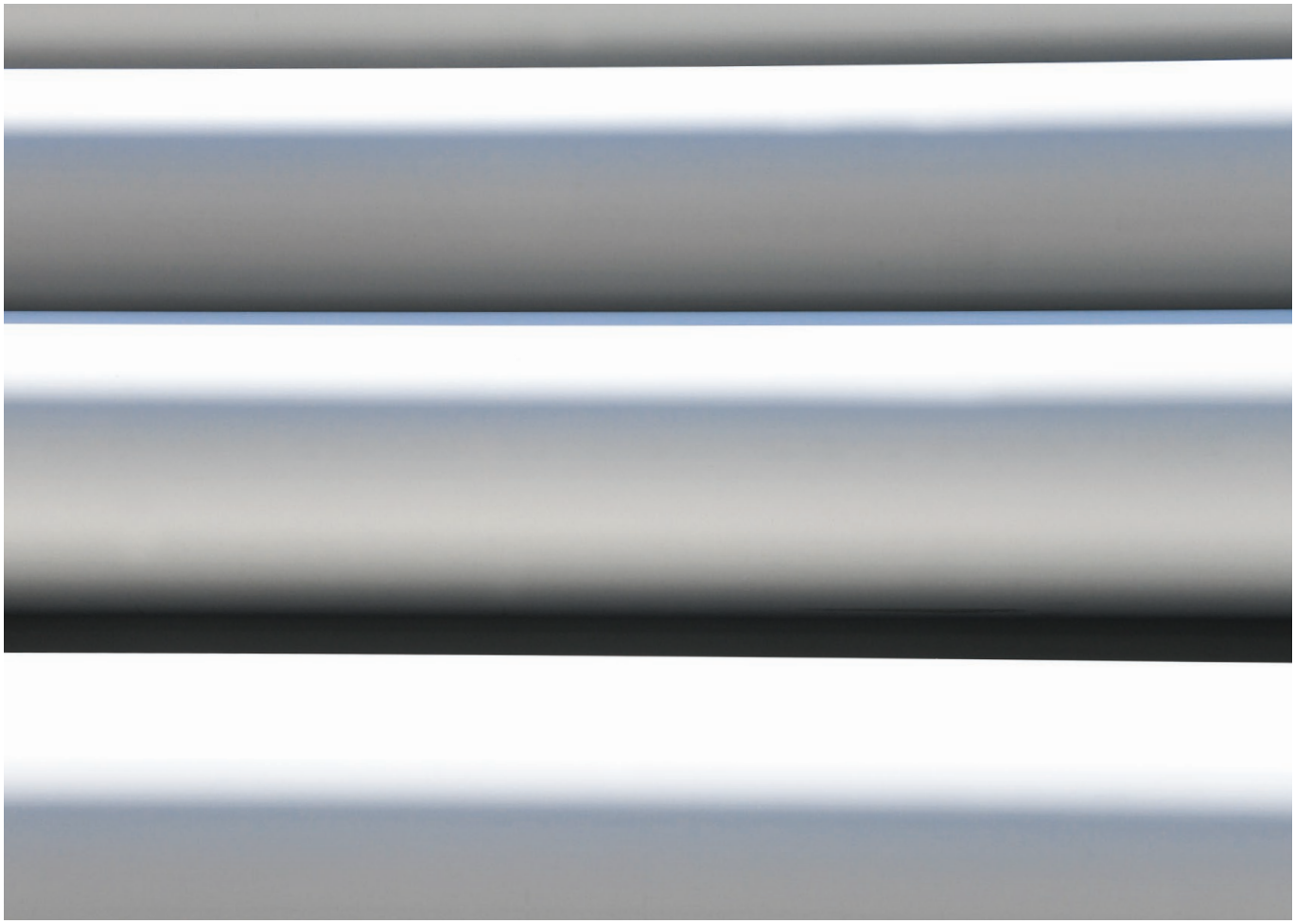
PVC has a high recyclability and can be mechanically recycled back into a pipe product performing the same structural function as one made only from virgin material. PVC as a material hasn't got any limitations for the amount of recycled PVC that can be utilised but some limitations apply in terms of pipes requiring adherence to potable water standards, in that scenario then any recycled PVC needs to be incased in an inner layer, not in contact with the drinking water.

Recycled PVC materials are generally produced from mixed colour PVC, resulting in a variable colour which is not suitable for all the applications. This is due to PVC pipes being colour-coded for applications: Water pipes are blue, electrical conduits are orange and stormwater pipes are white.

The variable colour of recycled material makes it most appropriate for multi-layer pipes (e.g. triple layer pipes), where the inside and outside are made from a virgin material and the middle layer (approximately half the pipe mass) can be made from up to 100% recyclate. Multi-layer pipes can also facilitate the recycling of materials that contain some level of contamination where they can be enclosed in the inner layer. Multi-layer pipes are normally used for non-pressure application such as electrical conduit and DWV pipes.

Additional environmental work

- Use of Post Industrial and Consumer Recycled Material: In certain product applications Marley is using recycled material from industrial and consumer sources. This includes other products made using uPVC such as fencing, joinery, and packaging. Clean offcuts are delivered to our site for RXP to reprocess and use in the pipe manufacture. RXP also uses post-consumer recycled material that is sourced and recycled locally in certain product ranges.
- Collecting uPVC and PE Pipe Offcuts for Recycling – As well as offering a drop off service for taking clean pipe offcuts for recycling RXP has also been working with Waste Management New Zealand to offer a single stream collection service for uPVC and HDPE pipe offcuts. This service is steadily expanding across several different regional centres. Specific PVC recycling locations are available in NZ and PVC pipe can be recycled at general plastic recycling stations throughout NZ



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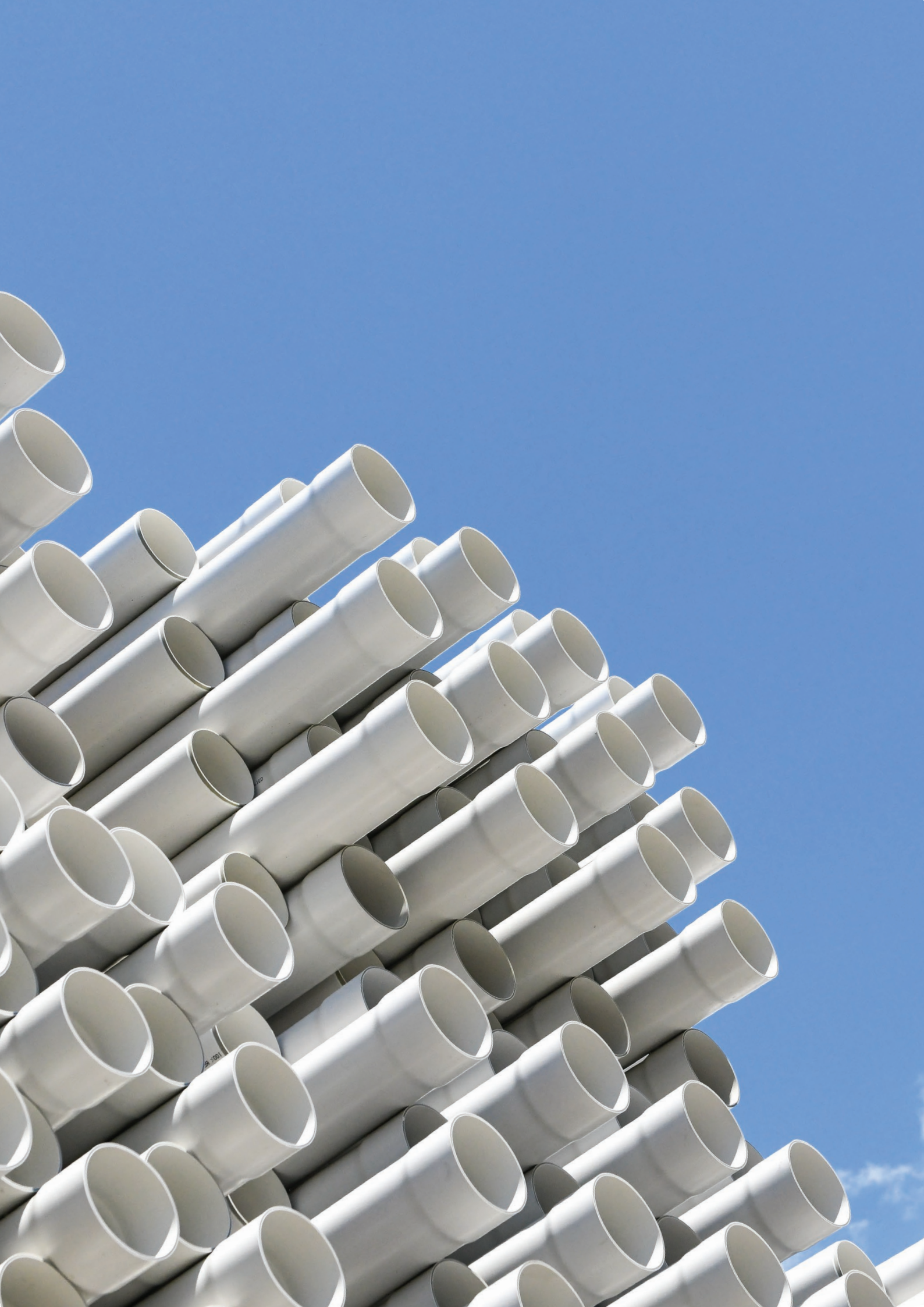


Appendix

Appendix A - Additional EPD Results

PVC non pressure

EPD Results for 1kg of Series 700 - Stormwater

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Environmental impacts	GWP-fossil	kg CO_2 eq.	2.39E+00	1.39E-01	5.24E-05	5.20E-03	-2.33E-01	3.65E-01	-5.42E-01
	GWP-biogenic	kg CO_2 eq.	1.48E-02	2.91E-04	1.78E-09	1.09E-05	-8.10E-03	4.20E-04	-2.68E-03
	GWP-luluc	kg CO_2 eq.	2.21E-03	5.70E-05	7.24E-13	2.13E-06	-5.77E-04	2.44E-05	-6.00E-04
	GWP-total	kg CO_2 eq.	2.40E+00	1.40E-01	5.24E-05	5.22E-03	-2.42E-01	3.66E-01	-5.45E-01
	ODP	kg CFC 11 eq.	9.67E-07	3.10E-08	7.67E-15	1.16E-09	-6.21E-08	6.04E-09	-2.41E-07
	AP	mol H^+ eq.	1.27E-02	9.58E-04	4.64E-07	3.53E-05	-4.56E-03	3.08E-04	-2.58E-03
	EP-freshwater	kg PO_4^{3-} eq.	3.04E-03	1.55E-04	6.82E-08	5.78E-06	6.15E-06	1.45E-04	-6.54E-04
	EP-freshwater	kg P eq.	6.98E-04	1.05E-05	3.91E-11	3.93E-07	2.27E-06	7.54E-06	-1.52E-04
	EP-marine	kg N eq.	2.52E-03	3.64E-04	2.02E-07	1.35E-05	9.16E-05	2.96E-04	-5.20E-04
	EP-terrestrial	mol N eq.	2.55E-02	3.98E-03	2.20E-06	1.48E-04	1.27E-03	1.16E-03	-5.33E-03
	POCP	kg NMVOC eq.	6.70E-03	9.65E-04	5.75E-07	3.59E-05	-1.16E-04	5.66E-04	-1.35E-03
	ADP-minerals&metals*	kg Sb eq.	3.54E-05	4.73E-07	1.19E-12	1.78E-08	3.06E-07	1.87E-07	-7.84E-06
	ADP-fossil*	MJ	4.86E+01	2.07E+00	1.93E-05	7.74E-02	-1.04E+01	3.12E-01	-1.15E+01
	WDP	m^3	1.92E+00	6.89E-03	2.70E-05	2.58E-04	-1.12E+01	2.41E-01	-3.67E-01
Resource use	PERE	MJ	4.14E+00	2.38E-02	4.54E-07	8.86E-04	-3.09E-02	2.42E-02	-4.28E-01
	PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERT	MJ	4.14E+00	2.38E-02	4.54E-07	8.86E-04	-3.09E-02	2.42E-02	-4.28E-01
	PENRE	MJ	5.22E+01	2.20E+00	1.94E-05	8.22E-02	-1.12E+01	3.32E-01	-1.23E+01
	PENRM	MJ	3.26E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRT	MJ	8.48E+01	2.20E+00	1.94E-05	8.22E-02	-1.12E+01	3.32E-01	-1.23E+01
	SM	kg	0.00E+00	0.00E+00	0.00E+00	1.00E+00	2.00E+00	3.00E+00	4.00E+00
	RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	FW	m^3	1.90E-02	1.03E-04	3.59E-09	3.84E-06	3.86E-04	3.39E-03	-4.28E-03

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Waste	Hazardous waste disposed	kg	7.51E-05	5.37E-06	5.29E-12	2.02E-07	4.87E-07	6.22E-07	-7.67E-06
	Non-hazardous waste disposed	kg	3.72E-01	1.04E-01	7.31E-08	3.90E-03	5.87E-02	4.94E-02	-7.91E-02
	Radioactive waste disposed	kg	6.80E-05	1.34E-05	5.91E-14	5.03E-07	1.72E-09	1.64E-06	-1.57E-05
Output flows	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Additional environmental impacts	GWP-GHG	kg CO_2 eq.	2.29E+00	1.38E-01	5.18E-05	5.15E-03	-2.11E-01	3.36E-01	-5.20E-01
	Particulate matter	disease incidence	9.34E-08	1.38E-08	1.31E-12	5.20E-10	-2.65E-08	-2.60E-08	4.27E-06
	Ionising radiation - human health	kBq U-235 eq	1.54E-01	9.45E-03	4.09E-10	3.53E-04	1.04E-05	3.63E-04	2.00E-03
	Eco-toxicity (freshwater)	CTUe	5.13E+01	1.79E+00	1.27E-03	6.72E-02	-7.80E+00	-7.73E+00	2.02E+01
	Human toxicity potential - cancer effects	CTUh	1.66E-09	8.47E-11	1.03E-14	3.17E-12	-5.26E-11	-4.95E-11	1.12E-07
	Human toxicity potential -non cancer effects	CTUh	4.34E-08	2.08E-09	7.02E-13	7.81E-11	-7.14E-09	-7.06E-09	2.18E-08
	Soil quality	dimensionless	7.79E+00	1.44E+00	3.21E-06	5.42E-02	1.56E+00	1.61E+00	3.56E-01

	Indicator	Unit	Quantity
Biogenic content	Biogenic carbon content in product	kg C	0.00E+00
	Biogenic carbon content in packaging	kg C	6.53E-03

EPD Results for 1kg of Series 2700 - Electrical Duct

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Environmental impacts	GWP-fossil	kg CO_2 eq.	2.40E+00	3.84E-02	5.24E-05	5.20E-03	-2.33E-01	3.65E-01	-5.42E-01
	GWP-biogenic	kg CO_2 eq.	1.49E-02	8.04E-05	1.78E-09	1.09E-05	-8.10E-03	4.20E-04	-2.68E-03
	GWP-luluc	kg CO_2 eq.	2.22E-03	1.57E-05	7.24E-13	2.13E-06	-5.77E-04	2.44E-05	-6.00E-04
	GWP-total	kg CO_2 eq.	2.41E+00	3.85E-02	5.24E-05	5.22E-03	-2.42E-01	3.66E-01	-5.45E-01
	ODP	kg CFC 11 eq.	9.72E-07	8.54E-09	7.67E-15	1.16E-09	-6.21E-08	6.04E-09	-2.41E-07
	AP	mol H^+ eq.	1.33E-02	2.64E-04	4.64E-07	3.53E-05	-4.56E-03	3.08E-04	-2.58E-03
	EP-freshwater	kg PO_4^{3-} eq.	3.08E-03	4.28E-05	6.82E-08	5.78E-06	6.15E-06	1.45E-04	-6.54E-04
	EP-freshwater	kg P eq.	6.97E-04	2.90E-06	3.91E-11	3.93E-07	2.27E-06	7.54E-06	-1.52E-04
	EP-marine	kg N eq.	2.64E-03	1.00E-04	2.02E-07	1.35E-05	9.16E-05	2.96E-04	-5.20E-04
	EP-terrestrial	mol N eq.	2.69E-02	1.10E-03	2.20E-06	1.48E-04	1.27E-03	1.16E-03	-5.33E-03
	POCP	kg NMVOC eq.	7.03E-03	2.66E-04	5.75E-07	3.59E-05	-1.16E-04	5.66E-04	-1.35E-03
	ADP-minerals&metals*	kg Sb eq.	3.54E-05	1.30E-07	1.19E-12	1.78E-08	3.06E-07	1.87E-07	-7.84E-06
	ADP-fossil*	MJ	4.90E+01	5.71E-01	1.93E-05	7.74E-02	-1.04E+01	3.12E-01	-1.15E+01
	WDP	m^3	1.87E+00	1.90E-03	2.70E-05	2.58E-04	-1.12E+01	2.41E-01	-3.67E-01
Resource use	PERE	MJ	4.13E+00	6.57E-03	4.54E-07	8.86E-04	-3.09E-02	2.42E-02	-4.28E-01
	PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERT	MJ	4.13E+00	6.57E-03	4.54E-07	8.86E-04	-3.09E-02	2.42E-02	-4.28E-01
	PENRE	MJ	5.26E+01	6.06E-01	1.94E-05	8.22E-02	-1.12E+01	3.32E-01	-1.23E+01
	PENRM	MJ	3.26E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRT	MJ	8.51E+01	6.06E-01	1.94E-05	8.22E-02	-1.12E+01	3.32E-01	-1.23E+01
	SM	kg	0.00E+00	0.00E+00	0.00E+00	1.00E+00	2.00E+00	3.00E+00	4.00E+00
	RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	FW	m^3	1.91E-02	2.83E-05	3.59E-09	3.84E-06	3.86E-04	3.39E-03	-4.28E-03
Waste	Hazardous waste disposed	kg	1.02E-04	1.48E-06	5.29E-12	2.02E-07	4.87E-07	6.22E-07	-7.67E-06
	Non-hazardous waste disposed	kg	3.72E-01	2.87E-02	7.31E-08	3.90E-03	5.87E-02	4.94E-02	-7.91E-02
	Radioactive waste disposed	kg	7.05E-05	3.71E-06	5.91E-14	5.03E-07	1.72E-09	1.64E-06	-1.57E-05
Output flows	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Additional environmental impacts	GWP-GHG	kg CO_2 eq.	2.30E+00	3.80E-02	5.18E-05	5.15E-03	-2.11E-01	3.36E-01	-5.20E-01
	Particulate matter	disease incidence	9.44E-08	3.82E-09	1.31E-12	5.20E-10	-2.65E-08	-2.60E-08	4.27E-06
	Ionising radiation - human health	kBq U-235 eq	1.57E-01	2.61E-03	4.09E-10	3.53E-04	1.04E-05	3.63E-04	2.00E-03
	Eco-toxicity (freshwater)	CTUe	5.12E+01	4.95E-01	1.27E-03	6.72E-02	-7.80E+00	-7.73E+00	2.02E+01
	Human toxicity potential - cancer effects	CTUh	1.66E-09	2.34E-11	1.03E-14	3.17E-12	-5.26E-11	-4.95E-11	1.12E-07
	Human toxicity potential -non cancer effects	CTUh	4.35E-08	5.75E-10	7.02E-13	7.81E-11	-7.14E-09	-7.06E-09	2.18E-08
	Soil quality	dimensionless	7.84E+00	3.98E-01	3.21E-06	5.42E-02	1.56E+00	1.61E+00	3.56E-01

	Indicator	Unit	Quantity
Biogenic content	Biogenic carbon content in product	kg C	0.00E+00
	Biogenic carbon content in packaging	kg C	6.53E-03

PVC pressure

EPD results for 1kg of Series 800-Small (Water Supply)

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Environmental impacts	GWP-fossil	kg CO_2 eq.	2.63E+00	5.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-biogenic	kg CO_2 eq.	1.67E-02	1.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-luluc	kg CO_2 eq.	2.41E-03	2.20E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-total	kg CO_2 eq.	2.65E+00	5.40E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ODP	kg CFC 11 eq.	1.06E-06	1.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	AP	mol H^+ eq.	1.46E-02	3.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-freshwater	kg PO_4^{3-} eq.	3.36E-03	6.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-freshwater	kg P eq.	7.61E-04	4.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-marine	kg N eq.	2.90E-03	1.41E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-terrestrial	mol N eq.	2.95E-02	1.54E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	POCP	kg NMVOC eq.	7.74E-03	3.73E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ADP-minerals&metals*	kg Sb eq.	3.71E-05	1.83E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ADP-fossil*	MJ	5.46E+01	8.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	WDP	m^3	2.05E+00	2.67E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Resource use	PERE	MJ	4.27E+00	9.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERT	MJ	4.27E+00	9.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRE	MJ	5.86E+01	8.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRM	MJ	3.56E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRT	MJ	9.43E+01	8.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	FW	m^3	2.09E-02	3.97E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste	Hazardous waste disposed	kg	1.10E-04	2.08E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Non-hazardous waste disposed	kg	3.96E-01	4.02E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Radioactive waste disposed	kg	7.67E-05	5.20E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Output flows	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Additional environmental impacts	GWP-GHG	kg CO_2 eq.	2.52E+00	5.32E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Particulate matter	disease incidence	1.03E-07	5.36E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Ionising radiation - human health	kBq U-235 eq	1.72E-01	3.65E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Eco-toxicity (freshwater)	CTUe	5.32E+01	6.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Human toxicity potential - cancer effects	CTUh	1.76E-09	3.28E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Human toxicity potential -non cancer effects	CTUh	4.62E-08	8.06E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Soil quality	dimensionless	8.40E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Indicator	Unit	Quantity
Biogenic content	Biogenic carbon content in product	kg C	0.00E+00
	Biogenic carbon content in packaging	kg C	3.17E-03

EPD results for 1kg of Series 1850 (Water Supply)

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Environmental impacts	GWP-fossil	kg CO_2 eq.	2.71E+00	5.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-biogenic	kg CO_2 eq.	1.70E-02	1.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-luluc	kg CO_2 eq.	2.51E-03	2.20E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	GWP-total	kg CO_2 eq.	2.73E+00	5.40E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ODP	kg CFC 11 eq.	1.08E-06	1.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	AP	mol H^+ eq.	1.50E-02	3.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-freshwater	kg PO_4^{3-} eq.	3.52E-03	6.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-freshwater	kg P eq.	8.05E-04	4.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-marine	kg N eq.	2.97E-03	1.41E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EP-terrestrial	mol N eq.	3.02E-02	1.54E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	POCP	kg NMVOC eq.	7.95E-03	3.73E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ADP-minerals&metals*	kg Sb eq.	3.75E-05	1.83E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	ADP-fossil*	MJ	5.64E+01	8.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	WDP	m^3	2.06E+00	2.67E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Resource use	PERE	MJ	4.32E+00	9.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PERT	MJ	4.32E+00	9.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRE	MJ	6.05E+01	8.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRM	MJ	3.60E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	PENRT	MJ	9.65E+01	8.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	FW	m^3	2.13E-02	3.97E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste	Hazardous waste disposed	kg	1.10E-04	2.08E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Non-hazardous waste disposed	kg	4.01E-01	4.02E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Radioactive waste disposed	kg	7.83E-05	5.20E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Output flows	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Additional environmental impacts	GWP-GHG	kg CO_2 eq.	2.60E+00	5.32E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Particulate matter	disease incidence	1.05E-07	5.36E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Ionising radiation - human health	kBq U-235 eq	1.77E-01	3.65E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Eco-toxicity (freshwater)	CTUe	5.45E+01	6.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Human toxicity potential - cancer effects	CTUh	1.81E-09	3.28E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Human toxicity potential -non cancer effects	CTUh	4.71E-08	8.06E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Soil quality	dimensionless	8.57E+00	5.59E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Indicator	Unit	Quantity
Biogenic content	Biogenic carbon content in product	kg C	0.00E+00
	Biogenic carbon content in packaging	kg C	3.17E-03

Appendix B – Product Detail

Table 1 and Table 2 show product details for RXP pipe products included in this study. Other product specifications are available on their website.

Table 1. PVC non-pressure products

Series	Application	DN Nominal Size (mm)	Density (kg/m)	Length (m)	Product Code
100	DWV	32	0.344	6	100.32.6SJ
100	DWV	40	0.437	6	100.40.6SJ
100	DWV	50	0.612	6	100.50.6SJ
100	DWV	65	0.865	6	100.65.6SJ
100	DWV	80	1.205	6	100.80.6SJ
100	DWV	100	1.915	4	100SN10.100.4DRJ
100	DWV	100	1.915	6	100SN10.100.6RJ
100	DWV	100	1.915	6	100SN10.100.6SJ
100	DWV	100	2.178	6	100SN16.100.6RJ
100	DWV	150	4.65	6	100SN16.150.4RJ
100	DWV	150	4.65	6	100SN16.150.6RJ
100	DWV	150	4.65	6	100SN16.150.6SJ
100	DWV	175	7.079	6	100SN16.175.6RJ
100	DWV	225	11.185	6	100SN16.225.6RJ
100	DWV	300	17.688	4	100SN16.300.4RJ
100	DWV	300	17.688	6	100SN16.300.6RJ
100	DWV	375	28.747	4	100SN16.375.4RJ
100	DWV	375	28.747	6	100SN16.375.6RJ
100	DWV	475	46.66	6	100SN16.475.6RJ
100	DWV	150	2.924	6	100SN4.150.6RJ
100	DWV	150	2.924	6	100SN4.150.6SJ
100	DWV	175	4.568	6	100SN4.175.6RJ
100	DWV	225	7.303	6	100SN4.225.6RJ
100	DWV	300	11.365	6	100SN4.300.6RJ
100	DWV	100	1.575	6	100SN6.100.6RJ
100	DWV	100	1.575	6	100SN6.100.6SJ
100	DWV	150	3.682	6	100SN8.150.6RJ
100	DWV	175	6.153	6	100SN8.175.6RJ
100	DWV	225	9.03	6	100SN8.225.6RJ
100	DWV	300	14.77	4	100SN8.300.4RJ
100	DWV	300	14.77	6	100SN8.300.6RJ
100	DWV	375	23.097	4	100SN8.375.4RJ
100	DWV	375	23.097	6	100SN8.375.6RJ
100	DWV	475	33.39	4	100SN8.475.4RJ
100	DWV	475	33.39	6	100SN8.475.6RJ
2700	Electrical	150	3.179	6	2700.150.LD.6SJ
2700	Electrical	50	0.609	6	2700.50.6SJ
550	Culvert	110	1.211	6	550.110.6SJ
550	Culvert	160	2.496	6	550.160.6SJ
550	Culvert	200	3.088	6	550.200.6SJ
550	Culvert	250	4.953	6	550.250.6SJ
550	Culvert	315	7.837	6	550.315.6SJ
550	Culvert	400	12.532	6	550.400.6PE.TD
550	Culvert	400	12.532	6	550.400.6SJ
550	Culvert	400	12.532	6	550.400.6SJ.TD
550	Culvert	500	19.91	6	550.500.6SJ
550	Culvert	160	2.496	6	550WH.160.6SJ
550	Culvert	250	4.953	6	550WH.250.6SJ.TD
700	Stormwater	100	1.392	6	700SN4.100.6SJ
700	Stormwater	160	2.945	6	700SN4.150.6SJ
700	Stormwater	225	7.245	6	700SN4.225.6RJ
700	Stormwater	90	0.972	6	700SN4.90.6SJ

Table 2. PVC pressure products

Series	Application	DN Nominal Size (mm)	Density (kg/m)	Length (m)	Product Code
800- Large	Pressure	100	3.035	6	800.100.PN12.6PE
800- Large	Pressure	100	3.035	6	800.100.PN12.6RJ
800- Large	Pressure	100	3.035	6	800.100.PN12.6SJ
800- Large	Pressure	100	3.684	6	800.100.PN15.6RJ
800- Large	Pressure	100	1.610	6	800.100.PN6.6RJ
800- Large	Pressure	100	1.610	6	800.100.PN6.6SJ
800- Large	Pressure	100	2.368	6	800.100.PN9.6RJ
800- Large	Pressure	100	2.368	6	800.100.PN9.6SJ
800- Large	Pressure	125	4.524	6	800.125.PN12.6RJ
800- Large	Pressure	125	2.430	6	800.125.PN6.6RJ
800- Large	Pressure	125	3.535	6	800.125.PN9.6RJ
800- Large	Pressure	150	5.946	6	800.150.PN12.6RJ
800- Large	Pressure	150	5.946	6	800.150.PN12.6SJ
800- Large	Pressure	150	7.200	6	800.150.PN15.6RJ
800- Large	Pressure	150	8.608	6	800.150.PN18.6RJ
800- Large	Pressure	150	3.127	6	800.150.PN6.6RJ
800- Large	Pressure	150	4.589	6	800.150.PN9.6RJ
800- Large	Pressure	150	4.589	6	800.150.PN9.6SJ
800- Large	Pressure	175	4.609	6	800.175.PN6.6RJ
800- Large	Pressure	175	6.490	6	800.175.PN9.6RJ
800- Large	Pressure	200	10.607	6	800.200.PN12.6RJ
800- Large	Pressure	200	12.888	6	800.200.PN15.6RJ
800- Large	Pressure	200	5.632	6	800.200.PN6.6RJ
800- Large	Pressure	200	8.128	6	800.200.PN9.6PE
800- Large	Pressure	200	8.128	6	800.200.PN9.6RJ
800- Large	Pressure	225	6.912	6	800.225.PN6.6RJ
800- Large	Pressure	250	8.656	6	800.250.PN6.6RJ
800- Large	Pressure	250	12.642	6	800.250.PN9.6RJ
800- Large	Pressure	300	10.972	6	800.300.PN6.6RJ
800- Large	Pressure	300	15.919	6	800.300.PN9.6RJ
800- Large	Pressure	32	0.427	6	800.32.PN12.6SJ
800- Large	Pressure	32	0.517	6	800.32.PN15.6SJ
800- Large	Pressure	375	33.385	6	800.375.PN12.6RJ
800- Large	Pressure	375	17.590	6	800.375.PN6.6RJ
800- Large	Pressure	375	25.631	6	800.375.PN9.6RJ
800- Large	Pressure	40	0.558	6	800.40.PN12.6SJ
800- Large	Pressure	40	0.671	6	800.40.PN15.6SJ
800- Large	Pressure	40	0.432	6	800.40.PN9.6SJ
800- Large	Pressure	450	27.956	6	800.450.PN6.6RJ
800- Large	Pressure	450	40.713	6	800.450.PN9.6RJ
800- Large	Pressure	50	0.852	6	800.50.PN12.6PE
800- Large	Pressure	50	0.853	6	800.50.PN12.6SJ
800- Large	Pressure	50	1.029	6	800.50.PN15.6SJ
800- Large	Pressure	50	0.470	6	800.50.PN6.6SJ
800- Large	Pressure	50	0.670	6	800.50.PN9.6RJ
800- Large	Pressure	50	0.670	6	800.50.PN9.6SJ
800- Large	Pressure	65	1.333	6	800.65.PN12.6SJ
800- Large	Pressure	65	0.718	6	800.65.PN6.6RJ
800- Large	Pressure	65	1.045	6	800.65.PN9.6RJ
800- Large	Pressure	65	1.045	6	800.65.PN9.6SJ
800- Large	Pressure	80	1.854	6	800.80.PN12.6RJ
800- Large	Pressure	80	1.854	6	800.80.PN12.6SJ
800- Large	Pressure	80	1.001	6	800.80.PN6.6RJ
800- Large	Pressure	80	1.001	6	800.80.PN6.6SJ
800- Large	Pressure	80	1.443	6	800.80.PN9.6RJ
800- Large	Pressure	80	1.443	6	800.80.PN9.6SJ


DN250

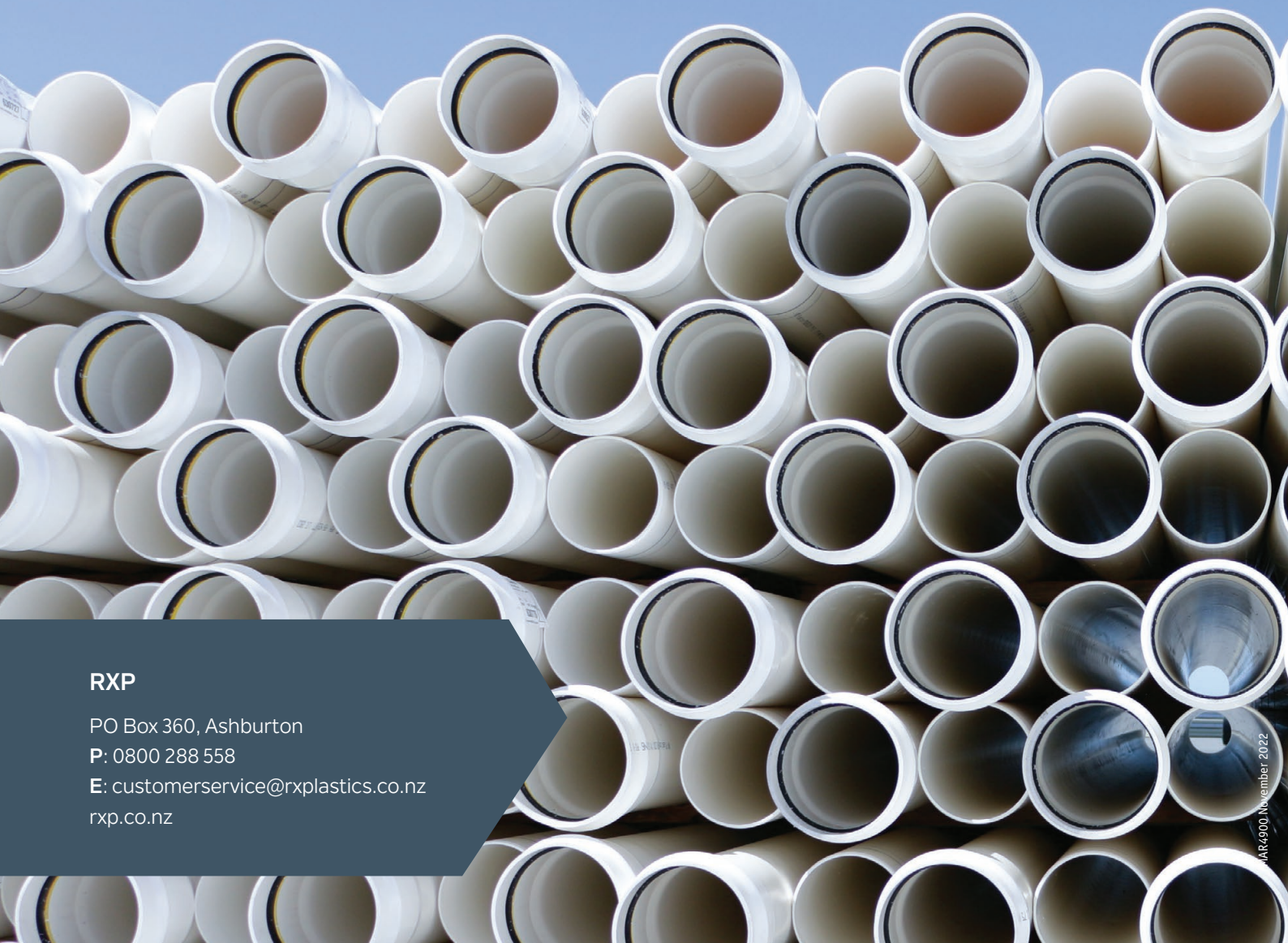
Sustainable Manufacturing

RXP is committed to creating environmentally sustainable processes and products and was the first plastics manufacturer in New Zealand to achieve ISO14001 registration. We are also Best Environmental Practice certified for our entire range of manufactured uPVC systems. This means we get our raw materials from sustainable and responsible sources, continuously work on our manufacturing processes to reduce our environmental footprint and accept our products back at the end of their useful life for recycling.

ISO 9001
ISO 14001
BUREAU VERITAS Certification

MADE USING BEST ENVIRONMENTAL PRACTICE

100% CERTIFIED RENEWABLE ENERGY



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